5. DETAILED GUIDANCE FOR THE RATING FORM

This chapter provides detailed guidance for answering the questions on the wetland rating form. The questions are listed in the order they appear on the form. Results from each section should be summarized in the spaces provided on the first page of the form.

5.1 WETLANDS NEEDING SPECIAL PROTECTION

Some wetlands may have characteristics, conditions, or values that are protected by laws or regulations in addition to the Critical Areas Ordinance or the State and Federal Clean Water Acts. Questions A1-A4 will help you identify whether the wetland being rated also needs to be protected based on laws that are outside the scope of this rating system.

Questions A1 - 4. Check List for Wetlands That Need Special Protection, and That Are Not Included in the Rating

A1. *Has the wetland been documented as a habitat for any federally listed Threatened or Endangered plant or animal species (T/E species)?*

For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database. Contact the U.S Fish and Wildlife Service or the State Department of Fish and Wildlife.

A2. *Has the wetland been documented as habitat for any State listed Threatened or Endangered plant or animal species?*

For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Contact the Washington State Department of Fish and Wildlife or the Natural Heritage Program at the Department of Natural Resources for this information.

A3. *Does the wetland contain individuals of Priority species listed by the WDFW for the state?*

There are 40 vertebrate species, 28 invertebrate species, and 14 species groups currently on the PHS List. These constitute about 16% of Washington's approximately 1000 vertebrate species and a fraction of the state's invertebrate fauna. The current list of priority species can be found on the state Fish and Wildlife Department web page. http://wdfw.wa.gov/hab/phspage.htm

A4. *Does the wetland have a local significance in addition to its functions?*

Local jurisdictions may have classified the wetland using criteria specific to the jurisdiction. For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.

5.2 CLASSIFYING THE WETLAND

Scientists have come to understand that wetlands can perform functions in different ways. The way wetlands function depends to a large degree on hydrologic and geomorphic conditions (Brinson 1993). Because of these differences among wetlands, a new way to group, or classify, them has been developed. This new classification system, called the Hydrogeomorphic (HGM) Classification, groups wetlands into categories based on the geomorphic and hydrologic characteristics that control many functions. This revision to the rating system incorporates the new system as part of the questionnaire for characterizing a wetland's functions.

The rating system uses only the highest grouping in the classification (i.e. wetland class). Wetland classes are based on geomorphic setting such as riverine or depressional. The more detailed methods for assessing wetland functions developed for eastern and western Washington (Hruby et al. 1999, Hruby et al. 2000) refine this classification and subdivide some of the classes further. The categorization of functions developed for this rating system, however, does not require this level of detail.

A classification key is provided with the rating form to help you identify whether the wetland is riverine, depressional, slope, or lake-fringe. The "tidal" and "flats" classes are not needed in eastern Washington because these types of wetlands have not been found in this region. The key contains five questions that need to be answered sequentially starting with the first. The following section describes the criteria for identifying classes in more detail than found on the key.

Question 1: Lake-fringe (Lacustrine-fringe) Wetlands

Lake-fringe wetlands are separated from other wetlands based on the area and depth of open water present. If the area of open water next to a vegetated wetland is larger than 20 acres (8 hectares), and more than 10 feet deep (3m) over 30% of the open water areas, the wetland is considered to be "lake-fringe." These criteria were developed as part of the project to assess wetland functions in eastern Washington (Hruby et al. 2000), and differ slightly from the criteria of lacustrine wetlands in the Cowardin classification (Cowardin et al. 1979) and the criteria for lake-fringe wetlands in western Washington.

Wetlands found along the shores of large reservoirs such as those found behind the dams along the major rivers (e.g. Columbia, see figure 5) are considered to be lake-fringe. Although the area was once a river valley, the wetlands along the shores of the reservoirs function more like "lake" wetlands rather than "river" wetlands. The technical team revising the rating system decided to include wetlands along the shores of reservoirs as lake-fringe if they meet the thresholds for open water and depth.

Question 2: Slope Wetlands

Slope wetlands occur on hill or valley slopes where groundwater "daylights" and begins running along the surface, or immediately below the soil surface. Water in these wetlands flows only in one direction (down the slope) and the gradient is steep enough that the water is not impounded. The "downhill" side of the wetland is always the point of lowest elevation in the wetland. Figure 6 shows a slope wetland along the Columbia River where groundwater seeps to the surface at a point where the slope of the hillside changes.

Figure 6: Slope wetland along the Columbia River identified by the presence of wetland plants (*Carex sp*. *Juncus sp*.) Wetland occurs where there is a major break in this slope of the hillside.

Some slope wetlands can only be identified by their vegetation. For example, in the Palouse region, you may find a small swale that collects groundwater percolating through the loess (windblown) soils. The only indication that a wetland is present is the stand of cattails growing in the swale (Figure 7). Such swales are not considered to be "riverine" wetlands because there are no indications of a channel with defined banks nor indications of "overbank" flooding.

Figure 7: Slope wetland in Pullman identified by cattails in a swale.

Slope wetlands are distinguished from riverine wetlands by the lack of a defined stream bed with banks that can overflow during floods or high water. Slope wetlands may develop small rivulets along the surface, but they serve only to convey water away from the slope wetland.

Question 3: Riverine Wetlands

Riverine wetlands are those found in a valley or stream channel where they can be inundated by overbank flooding from the river or stream. They lie in the active floodplain of a river, and have important links to the water dynamics of the river or stream. The distinguishing characteristic of riverine wetlands in Washington is that they are frequently flooded by overbank flow from the stream or river. The flood waters are a major environmental factor that structures the ecosystem in these wetlands and control its functions.

In eastern Washington the technical committee reviewing the rating system decided that the frequency of overbank flooding needed to call a wetland "riverine" is at least once in 10 years (10 yr. "return" frequency). This is in contrast to western Washington where a wetland has to be flooded at least once every two years to be considered "riverine." The decision to reduce the flooding frequency for riverine wetlands is based on the observations that the region is often subject to periods of drought that may last several years. In periods of drought, wetlands that are an integral part of the river system may not get flooded. Even during periods of drought, however, they still function as an integral part of the river system because they are connected to the underground flows in the valley (hyporheic flows).

Most riverine wetlands in eastern Washington are relatively easy to identify because they lie directly within the channel as vegetated bars (Figure 8), vegetated channels (Figure 9), or are old oxbows within the floodplain (Figure 10). The riverine wetlands in the northeastern part of the state (Ferry, Stevens, Pend Oreille Counties) may be harder to identify because the broad valleys there were formed by glaciers rather than the existing rivers. The valley around Colville for example, is, or used to be, all wetland. These wetlands, however, are mostly slope wetlands rather than riverine. The floodplain of the Colville River is a narrow band within the much larger valley created by the glaciers.

Figure 8: Vegetated river bars on the Touchet River that are classified as Riverine wetlands.

Impoundment created by a beaver dam has increased the amount of open water in this wetland.

Figure 9: Riverine wetland in the Palouse where the entire channel is vegetated between the banks and a wetland. This channel has only seasonal flow. It is dry by late summer.

Figure 10: Oxbow wetland on the Colville River that is classified as Riverine.

Question 4: Depressional Wetlands

Depressional wetlands occur in depressions where elevations within the wetland are lower than in the surrounding landscape. The shapes of depressional wetlands vary, but in all cases, the movement of surface water and shallow subsurface water is toward the lowest point in the depression. The depression may have an outlet, but the lowest point in the wetland is somewhere within the boundary, not at the outlet.

Depressional wetlands can sometimes be hard to identify because the depression in which they are found are not very evident. By working through the key it may not be necessary to look at topographic maps, or try to identify that the lowest point of the wetland is in the middle. If a wetland has surface ponding, even if only for a short time, and is not lake-fringe or riverine it can be classified as depressional. Vernal pools shown in Figures 38 and 39, and the Alkali wetlands shown in Figures 40 and 41 are all depressional wetlands.

A depressional wetland can be hypothesized to exist where there is no surface ponding such as a bog without any open water. Such a wetland may be difficult to differentiate from a slope wetland, but is probably rare in eastern Washington. All of the depressional wetlands seen as part of the function assessment project and the revisions to the rating system have had some surface water ponding during part of the year.

Question 5: Wetland Is Hard to Classify

Sometimes it is hard to determine if the wetland meets the criteria for a specific wetland class. You may find characteristics of several different hydrogeomorphic classes within one wetland boundary. For example, seeps at the base of a slope often grade into a riverine wetland, or a small stream within a depressional wetland has a zone of flooding along its sides that would be classified as riverine.

If you have a wetland with the characteristics of several HGM classes present within its boundaries use the Table 2 to identify the appropriate class to use for rating. Use this table only if the area encompassed by the "recommended" class is at least 10% of the total area of wetland being rated. For example, if a slope wetland grades into a riverine wetland and the area of the riverine wetland is ¼ of the total use the questions for riverine wetlands. However, if the area that would be classified as riverine is less than 10% (e.g. 0.5 acres out of a total wetland area of 10 acres) use the questions for the slope wetlands.

Table 2: Classification of wetlands with multiple hydrogeomorphic classes for the purpose of rating.

HGM Classes Within One Delineated Wetland Boundary	**Class to Use in Rating if area of this class > 10% total**
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine	Depressional
Depressional + Lake-fringe	Depressional

If you are still unable to determine which of the above criteria apply to your wetland, or you have more than two HGM classes within a wetland boundary, classify the wetland as depressional for the rating. Complicated wetlands that have been found in eastern Washington during the calibration of the method have always had some features of depressional wetlands, and thus, could be classified as depressional.

5.3 CATEGORIZATION BASED ON FUNCTIONS

The functions that a wetland performs are characterized by answering a series of questions that note the presence, or absence, of certain indicators. Indicators are easily observed characteristics that are correlated with quantitative or qualitative observations of a function (Hruby et al. 2000). Most indicators are fixed characteristics that describe the structure of the ecosystem or its physical, chemical, and geologic properties (Brinson 1995). Indicators, unfortunately, cannot reflect actual rates at which functions are performed. Rather, they reflect the capacity and opportunity that a wetland has to perform functions (for a detailed discussion of the relationship between indicators and functions see Hruby 1999, Hruby et al. 2000).

The questions about the indicators of functions are grouped by the hydrogeomorphic class of the wetland being rated (depressional, riverine, slope and lake-fringe) and then by the three major groups of functions wetlands perform (improving water quality, hydrologic functions, and wildlife habitat). The more detailed methods for assessing wetland functions in the Columbia Basin (Hruby et al. 2000) are divided into 15 different functions that fall into these three groups. The level of detail regarding functions found in the assessment methods, however, is not needed for the simpler categorization done in this rating system.

"Baseflow Support" as a Function of Wetlands

There was some discussion during the revision of the rating system whether wetlands in eastern Washington provide water to streams during the summer and fall (called baseflow support), and whether this function should be rated along with the other hydrologic functions.

Initially the consensus of the teams developing the methods for assessing functions in Washington (Hruby et al. 1999, Hruby et al. 2000) was that "baseflow support" may be provided by some wetlands, but it was not important enough to assess. More recently, other wetland hydrologists were consulted from around the country and they supported this initial conclusion (R. Jackson and R.J. Pierce, personal communications). There were three major reasons why this function was not judged to be important:

1) Wetlands whose major source of water is groundwater are not providing the function since they do not store significant amounts of surface water to recharge the baseflows.
2) Most surface water left over from spring rains and melting will have evaporated by the late summer when baseflow is most needed. If water is present late in the summer it is usually a result of groundwater.
3) Given the high rate of evapotranspiration (ET) in eastern Washington (in excess of 36 in./yr in many areas), wetlands have to store very large amounts of water before there is a net balance of water going to groundwater. A simple water balance would suggest that a wetland has to impound more than 36 inches (deep) of surface water for there to be a net gain to groundwater in areas where the rate of ET is 36 inches. A net gain to groundwater, and therefore support to baseflow, is possible only when the amount of surface water stored in the wetland is greater than the amount lost through ET.

Much of the information about indicators used in the rating system is based on the seven methods for assessing wetland functions that have been developed in the state (Hruby et al. 1999, Hruby et al. 2000). The scores for the indicators used in this rating system were calibrated by using the information collected during the development of the methods in the Columbia Basin and during field visits outside the Columbia Basin by members of the review team. The rationale for choosing each indicator is given in a shaded box within the description of how to answer the field questions.

The three groups of functions (improving water quality, hydrologic functions, and wildlife habitat) are given approximately equal importance in setting the category for a wetland. Improving water quality and the hydrologic functions each have a maximum score of 32 points and the habitat functions a maximum score of 36 points out of a total of 100 points. The decision to give approximately equal weight to each group of functions is based on the fact that the laws and regulations regarding wetlands don't specify that any function, or group of functions, should be given more, or less importance, than another in protecting the wetland.

5.3.1 Potential and Opportunity for Performing Functions

One of the issues inherent in developing a characterization of functions is that the indicators used only represent structural characteristics of a wetland and its landscape. They do not measure rates at which functions are performed nor the ecological processes that control the functions. We are unable, for example, to actually measure the rate of sediment removal because we will probably not be present at the time sediments are coming into the wetland. A measurement of actual sediment removal would require monitoring the wetland during many times of the year and during several storms.

The scoring for each group of functions is divided into two parts to address our inability of measuring rates, processes, and habitat usage. One set of questions uses the structural characteristics in a wetland as indicators of the capability of performing a function. This is called the "Potential" for performing a function. The question we are trying to answer is: does the wetland have the necessary structures and conditions present within its boundaries to provide the function? For example, when characterizing how well a wetland can improve water quality we ask if the wetland has the vegetation to trap sediments and the right soils and chemistry to remove pollutants.

The second part in characterizing the function is called the "Opportunity." These questions characterize to what degree the wetland's position in the landscape will allow it to perform a specific function. For example, for "improving water quality," we ask if there are sources of pollutants in the watershed that come into the wetland. Wetlands found in polluted watersheds have a higher opportunity to perform the function than those that have few if any pollutants in the surface or groundwater. A wetland in a pristine watershed will not remove many pollutants regardless of how capable it is of doing so because none are coming into the wetland.

Example of Differences in Potential and Opportunity Among Wetlands
We have defined the function of “water quality” improvement as “removing pollutants”, and wetlands that remove more pollutants are considered to be more valuable and important than those that remove fewer pollutants. This general definition can be translated directly into pounds of pollutants removed per year. It is not, however, possible to directly measure the amount of pollutants removed in a wetland. In order to characterize the function we collect data on two different aspects of the function that we call potential and opportunity. The potential in this example is the maximum amount of pollutants a wetland can take up in a year given an unlimited amount of pollutants. The potential is based on the physical, biological, and chemical characteristics within the wetland itself. The opportunity in this example is the amount of pollutants actually entering the wetland, and is based on the characteristics of the landscape in which the wetland is found. Consider two wetlands of equal size. The first wetland can remove a maximum of 20 lbs. of pollutants per year and the second can remove 100 lbs. per year. This is their potential. The first wetland has 100 lbs of pollutants coming into it (the opportunity) so it actually removes its maximum potential (20 lbs/year) but lets 80 lbs continue going downstream. The second wetland only has 5 lbs. of pollutants coming in. Though its potential is much higher than that of the first, it actually removes fewer pollutants (only 5 lbs/year), but it removes all pollutants coming in. The first wetland has a low potential but high opportunity and the second has a high potential with a low opportunity.

Opportunity and potential are both integral parts of wetland functions as we define them. The key concepts in both state and federal clean water acts is to "maintain beneficial uses" and "preserve (and restore) biological integrity" of our waters. In the GMA (RCW 36.70A.172) it states that cities and counties need to "protect the functions and values of critical areas." The beneficial uses, or values, of wetlands in terms of functions is removing nutrients and reducing flooding. The other value of “biological integrity" is defined in terms of the habitat functions. This means that any characterization needs to include both the “potential” and the “opportunity” aspects of the functions. For example, a wetland with good (undisturbed) connections to other wetlands or natural areas (i.e. a high opportunity) will provide better habitat than the same wetland surrounded by a residential or urban area. In the latter case the habitat is not as suitable because many animals that would use the wetland do not have access to it.

The technical team reviewing the rating system for eastern Washington decided to give equal weight to the “Potential” and “Opportunity” in the scoring of the functions. Such a weighting is a value judgment because we do not have any scientific data to indicate which is more important in the overall function in eastern Washington or among wetlands of different types. Other options might have been to give unequal weights to potential and opportunity (e.g. 75% of the score is potential and 25% is opportunity). From the Department of Ecology’s perspective the only fair division is to score opportunity and potential equally because we do not have information that would allow us to assign different levels of importance to these two factors of function.

The scoring on the data sheet is set up to reflect this decision. In the sections on the water quality and hydrologic functions there is one question asking whether the wetland has the opportunity to perform the function. If the wetland has the opportunity, its score for the indicators of “potential” is doubled. A more complex scaling of the score for opportunity of the water quality and hydrologic functions was considered, but had to be abandoned based on the experience gained in developing the 7 methods for assessing functions (Hruby et al. 1999, Hruby et al. 2000) and the two rating systems (east and west).

The first reason is that the teams developing the methods could not simplify the list of indicators for assessing the opportunity for most functions. For example, assessing the water quality functions in western Washington in more detail would have required more than 20 environmental indicators. Secondly, there was no consensus among the experts developing the methods in rating the opportunity of individual wetlands used for reference. For example, one reference wetland was observed to receive stormwater draining a residential area. The experts, however, could not agree if the opportunity to remove pollutants was high or moderate. Everyone agreed that it had some opportunity but there was no agreement on how much without taking extensive measurements during storms.   Finally, it was difficult to obtain consistent results among users in measuring even a limited number of indicators for opportunity for the water quality and hydrologic functions.

The opportunity for a wetland to provide habitat is easier to characterize. There are four questions that reflect different types of opportunity and levels of opportunity. The scaling for these questions, however, has been set up so the total points possible are the same as the total for the structural indicators of habitat within the wetland itself (its potential).

Example of Scoring Potential and Opportunity

A wetland can score a maximum of 100 points on the questions related to functions (32 points for water quality improvement, 32 points for the hydrologic functions, and 36 points for habitat). The following table shows the results from two different wetlands. One wetland has the opportunity to perform the water quality and hydrologic functions while the other does not. Wetland B, however, has a better potential and opportunity to perform the habitat functions so the final scores are the same.

FUNCTION	Wetland A	Wetland B
Potential for Improving Water Quality	14	14
Opportunity for Improving Water Quality	Yes (score x 2)	No
TOTAL for Improving Water Quality	**28**	**14**
Potential for Decreasing Flooding and Erosion	6	12
Opportunity for Decreasing Flooding and Erosion	Yes (score x 2)	No
TOTAL for Decreasing Flooding and Erosion	**12**	**12**
Potential for Habitat	12	16
Opportunity for Habitat	8	18
TOTAL for Habitat	**20**	**34**
TOTAL score for all functions	**60**	**60**

5.3.2 Classifying Vegetation

There are several questions on the data sheet that ask you to classify the vegetation found within the wetland into different types. This should not be confused with classifying the wetland itself as described earlier. The classification of vegetation used for the rating system is mostly (with some exceptions noted in the field form) based on the “Cowardin” classification, and the criteria for these categories are adapted from Cowardin (1979). “Cowardin” vegetation types are distinguished by the uppermost layer of vegetation (forest, shrub, etc.) that provides more than 30% surface cover within the area of its distribution. If the total cover of vegetation is less than 30% the area does not have a vegetation type. It should be identified as open water or sand/mud flat.

A **forested area** is one where the canopy of woody vegetation over 20 ft. (6 m) tall (such as cottonwood, aspen, cedar, etc.) covers at least 30% of the ground. Trees need to be rooted in the wetland in order to be counted towards the estimates of cover (unless you are in a mosaic of small wetlands as defined on p. 15). Some small wetlands may have a canopy but the trees are not rooted within the wetland. In this case the wetland does not have a forested class.

A **shrubby area** (scrub/shrub) in a wetland is one where woody vegetation less than 20 ft. (6 m) tall is the top layer of vegetation. To count, the shrub vegetation must provide at least 30% cover and be the uppermost layer. Examples of common shrubs in eastern Washington wetlands include the native rose, young alder, young cottonwoods, and red-osier dogwood.

An area of "emergent plants" in a wetland is one covered by erect, rooted herbaceous plants excluding mosses and lichens. These plants have stalks that will support the plant vertically in the absence of surface water during the growing season. This vegetation is present for most of the growing season in most years. To count, the emergent vegetation must provide at least 30% cover of the ground and be the upper-most layer. Cattails and bulrushes are good examples of plants in the "emergent" plant type.

Herbaceous plants are defined as seed-producing species that do not develop persistent woody tissue (stems and branches) but die back at the end of the growing season.

An area of aquatic bed plants is any area where rooted aquatic plants such as lily pads, pondweed, etc. cover more than 30% of the "pond" bottom. These plants grow principally on or below the surface of the water for most of the growing season in most years. This is in contrast to the "emergent" plants described above that have stems and leaves that extend above the water most of the time. Aquatic bed plants are found only in areas where there is seasonal or permanent ponding or inundation. *Lemna sp.* (duckweed) is not considered an aquatic bed species because it is not rooted. Aquatic bed vegetation does not always reach the surface and care must be taken to look into the water.

Sometimes it is difficult to determine if a plant found in the water is "aquatic bed" or "emergent." A simple criterion to separate emergent and aquatic bed plants most of the time is--If the stalk will support the plant vertically in the absence of water, it is emergent. If, however, the stalk is not strong enough to support the plant when water is removed, it is aquatic bed.

Examples of how different areas might be classified are given below.

- An area (polygon) of trees within the wetland boundary having a 50% cover of trees and with an understory of shrubs that have a 60% cover would be classified as a "forest." The trees are the highest layer of vegetation and meet the minimum requirement of 30% cover.

- An area with 20% cover of trees overlying a shrub layer with 60% cover would be classified as a "shrub." The trees do not meet the requirement for minimum cover.
- An area where trees or shrubs each cover less than 30%, but together have a cover greater than 30% is classified as "shrub."
- When trees and shrubs together cover less than 30% of an area, the zone is assigned to the dominant plant type below the shrub (e.g. emergent, aquatic bed, mosses and lichens) if these have greater than 30% cover.

Plants in the "emergent" category are further divided by their height. You are asked to identify emergent plants that are 0-12 inches (0-30cm) high, 12-40 inches (30-100cm) high, and more than 40 inches (> 1m) high. This estimate should be based on the maximum height the plant reaches during its growth period and the amount of cover provided by each height category. These categories are again distinguished on the basis of the uppermost layer of emergent plants that provides more than 30% surface cover within the area of its distribution. For example, an area with a 50% cover of bulrushes (plants > 40 inches) with an understory of sedges also covering 50% of a specific area (plants 12-40 inches high) would be mapped as having plants > 40 inches.

If you visit the wetland during the winter and early spring, many of the emergent plants will have died back and the stalks will be lying on the ground. Try to estimate how high the stalks would have been during the spring or summer.

You are asked to characterize the vegetation types in terms of how much area within the wetland is covered by a type. <u>The thresholds for scoring differ among the questions so use caution in filling out the rating form.</u>

To complete the next part of the rating form you will first need to classify the wetland into one of the four hydrogeomorphic classes. Answer only the question that pertains to the HGM class of the wetland being rated. The first letter of the question on the rating form identifies the wetland class for which the question is intended:

D = Depressional, R = Riverine, L = Lake-fringe, S = Slope.

The guidance below is divided into sections according to the HGM class of the wetland being rated. Each question on the rating form is addressed in turn.

5.3.3 Questions Starting with "D" (for Depressional Wetlands)

Water Quality and Hydrologic Functions in Depressional Wetlands

D 1.0 Does the Depressional Wetland have the Potential to Improve Water Quality?

D 1.1 *Characteristics of outflows of surface water from the wetland*: (This indicator is used in both the water quality and the hydrologic functions.)

> **Rationale for indicator:** Pollutants that are in the form of particulates (e.g. sediment, or phosphorus that is bound to sediment) will be retained in a wetland with no outlet. Wetlands with no outlet are, therefore, scored the highest for this indicator. An outlet that flows only seasonally is usually better at trapping sediments than one that is flowing all the time because there is no chance for a downstream release of particulates for most of the year (a review of the scientific literature on the "trapping" potential of wetlands is found in Adamus et. al. 1991).

As you walk around the edge of the depressional wetland note carefully if there are any indications that surface water leaves the wetland and flows further downgradient. The question is relatively easy to answer if you find a channel. Many depressional wetlands in eastern Washington, however, have outflows only during the wet season or during summer thunderstorms (seasonally or intermittently flowing). These are harder to locate and identify because they have no banks. Some indicators of seasonal outflows are as follows:

- A swale at one end of a depression that has a gradient away from the wetland and that has wetland vegetation in it (Figure 11).
- A section along the circumference of the wetland where the herbaceous vegetation is all lying in one direction and perpendicular to the circumference (last year's reed canary grass in Figure 11 is oriented in the direction of the outflow).
- A ditch that has been dug to drain the wetland

You are asked to characterize the surface outlet in one of three ways for the scoring, and these are:

- Wetland has no surface water outlet - You find no evidence that water leaves the wetland on the surface. The wetland lies in a depression in which the water never goes above the edge (Figure 12).
- Wetland has an intermittently flowing, or highly constricted, outlet. Intermittently flowing means that surface water flows out of the wetland during the "wet" season (seasonal outflow) or during heavy thunderstorms. Highly constricted outlets are those that are small or heavily incised, narrow channels anchored in steep slopes. In general, you will find marks of flooding or inundation three feet or more above the bottom of the outlet if the outlet is severely constricted. Another indicator of a severely constricted outlet is evidence of erosion of the down gradient side of the outlet. Small culverts (less than18" [40cm] in diameter) can usually be
- Wetland has a permanently flowing surface outlet - This means that the

wetland is a depression along a permanently flowing stream or is the point of groundwater discharge that does not dry out. Permanently flowing means that it flows most of the time. One can expect that some "permanent" flows dry up during periods of drought. In general, water should be flowing all year in 8 years out of 10 to be considered "permanent."

- NOTE: If you cannot find an outlet, or do not have access to it, in the depressional wetland, assume it is severely constricted when rating it.

Figure 11: The seasonal outflow of a depressional wetland. The swale is dry for most of the year, but is filled with reed canary grass. The arrow points in the direction of the outflow.

Last year's reed canary grass that is lying in the direction of the outflow.

Figure 12: A depressional wetland on a basalt plateau with no surface water outlet.

D 1.2 *The soil 2 inches below the surface is clay, organic, or smells anoxic (hydrogen sulfide or rotten eggs).*

Rationale for indicator: Clay soils, organic soils, and periods of anoxia in the soils are all good indicators that a wetland can remove a wide range of pollutants from surface water. The uptake of dissolved phosphorus and toxic compounds through adsorption to soil particles is highest when soils are high in clay or organic content (Mitsch and Gosselink 1993). Anoxic conditions (oxygen absent), on the other hand, are needed to remove nitrogen from the aquatic system. This process, called denitrification, is done by bacteria that live only in the absence of oxygen (Mitsch and Gosselink 1993).

To look at the soil, dig a small hole within the wetland boundary and pick a sample from the area that is about 2 inches below the surface. Usually it is best to sample the soil toward the middle of the wetland rather than at the edge. Do not, however, sample the soil under areas of permanent ponding. Avoid picking up any of the "duff" or recent plant material that lies on the surface. First smell the soil and determine if it has a smell of hydrogen sulfide (rotten eggs). If so you have answered the question. If the soil is not anoxic, determine if the soil is organic or clay. If you are unfamiliar with the methods for doing this, a key is provided in Appendix B.

D 1.3 *Characteristics of persistent vegetation (emergent, shrub, and/or forest):*

Rationale for indicator: Plants enhance sedimentation by acting like a filter, and cause sediment particles to drop to the wetland surface (for a review see Adamus et al. 1991). Plants in wetlands can take on different forms and structures. The intent of this question is to characterize how much of the wetland is covered with plants that persist throughout the year and provide a vertical structure to trap or filter out pollutants. It is assumed, however, that the effectiveness at trapping sediments and pollutants is severely reduced if the plants are grazed.

If you are familiar with the Cowardin classification of vegetation, you are looking for the areas that would be classified as "Emergent", "Scrub/shrub," or "Forested." These are all "persistent" types of vegetation; those species that normally remain standing at least until the beginning of the next growing season (Cowardin et al. 1979). If you need help in identifying these types of vegetation review the discussion on p. 29. Emergent plants do not have to be alive at the time of the site visit to qualify as persistent. The dead stalks of emergent species will provide a vertical structure to trap pollutants as well as live stalks.

You are asked to characterize the vegetation in terms of how much area within the wetland boundary is covered. There are three size thresholds used to score this characteristic – more than 1/10 of the wetland area is covered in persistent vegetation; more than 1/3 is covered; or more than 2/3 of the area is covered. These thresholds can usually be estimated visually in small wetlands. Large wetlands, however, may require you to draw the area of persistent vegetation on a map or aerial photo before you can feel confident that your estimates are accurate. **NOTE: this question applies only to persistent vegetation that is ungrazed** (or if grazed the vegetation is taller than 6 inches).

An easy way to estimate the amount of persistent vegetation is to draw a small diagram of the wetland boundary and within it map the areas that are open water, covered with aquatic bed plants, mudflats or rock. Also include areas that are grazed because much of the vertical structure of wetland plants is removed when plants are grazed. The remaining area is then by default the area of persistent vegetation. Figure 13 shows a depressional wetland in which persistent vegetation is between 1/10 and 1/3 the area of the wetland.

Figure 13: A depressional wetland where persistent vegetation is between 1/10 and 1/3 the area of the wetland.

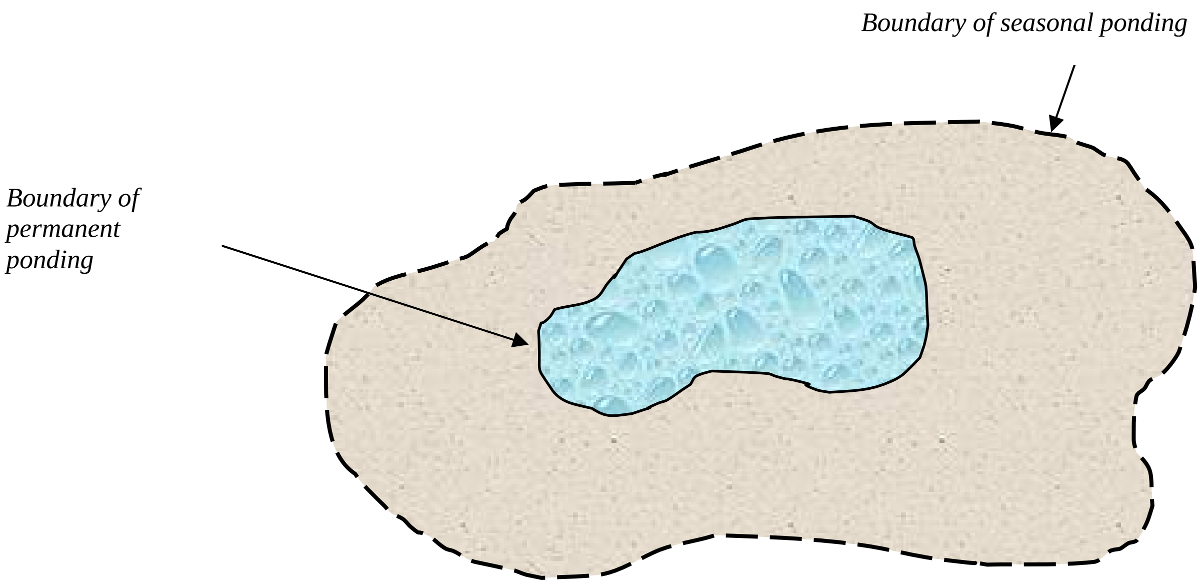
D 1.4 *Characteristics of seasonal ponding or inundation*:

Rationale for indicator: The area of the wetland that is seasonally ponded is an important characteristic in understanding how well it will remove nutrients, specifically nitrogen. The highest levels of nitrogen transformation occur in areas of the wetland that undergo a cyclic change between oxic (oxygen present) and anoxic (oxygen absent) conditions. The oxic regime (oxygen present) is needed so certain types of bacteria will change nitrogen that is in the form of ammonium ion (NH_4^+) to nitrate, and the anoxic regime is needed for denitrification (changing nitrate to nitrogen gas) (Mitsch and Gosselink 1993). The area that is seasonally ponded is used as an indicator of the area in the wetland that undergoes this seasonal cycling. The soils are oxygenated when dry but become anoxic during the time they are flooded.

To answer this question you will need to estimate how much of the wetland is seasonally ponded with water. This is the area that gets flooded at some time of the year, the water remains on the surface for 2 months or more, and then it dries out again.

One way to estimate this area is to make a rough sketch of the wetland boundary, and on this diagram draw the outside edge of the area you believe has surface water during the wet season. If the wetland also has permanent surface water you will have to draw this and subtract it when making your estimate (see Figure 14).

Figure 14: Sketch showing the boundaries of areas that are seasonally ponded and permanently ponded. The answer to question D 1.4 for this wetland is that the area seasonally ponded is more than ½ the total area of the wetland.



The boundary of seasonal ponding will usually coincide with the delineated boundary of the wetland in depressional wetlands of the Columbia Basin. The best indicator of the boundary where ponding lasts for more than two months is the upper edge of the areas where wetland plants are dominant (>50% cover of facultative, facultative-wet, or obligate species). This edge is often very distinct in the Columbia Basin.

There may be periods of time when a depressional wetland is flooded only very briefly during exceptionally heavy rainfall or snowmelt. This area of "brief ponding" should not be counted as "seasonal ponding." For example, if a site is visited during the wet season and wetland vegetation is inside the area of ponding then the area outside of the wetland vegetation line is probably only "briefly ponded." During the dry season, the boundary of areas ponded for several months (*seasonal ponding*) will have to be estimated by using one or more of the following indicators.

- Marks on trees and shrubs of water/sediment/debris (Figure 15). The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.
- Water stained vegetation lying on wetland surface (grayish or blackish in appearance such as downed and fragmented bulrush stems).
- Dried algae left on the stems of emergent vegetation and shrubs and on the wetland surface (Figures 16, 17).

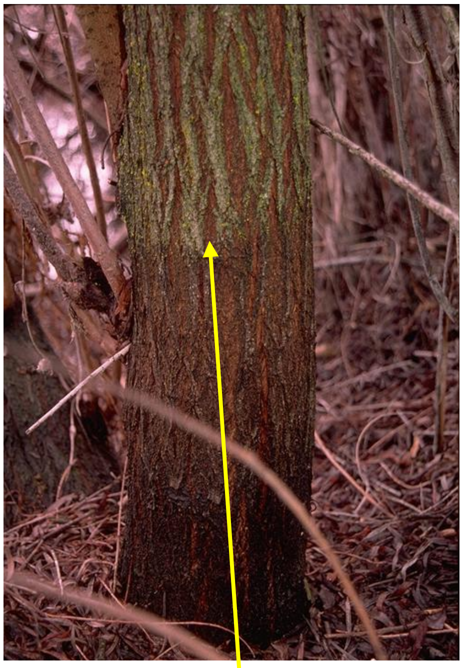


Figure 16: Small depressional wetland covered with algae. The edge of the algae marks the area that is seasonally ponded.

Figure 15: Water mark on tree showing vertical extent of seasonal ponding.

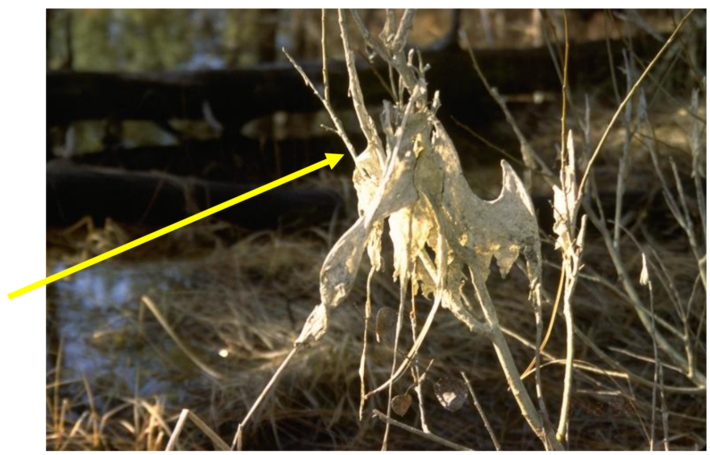


Figure 17: Algae left hanging on vegetation as wetland dried out. The top of the algae marks the vertical extent of seasonal ponding. The boundary of seasonal ponding can be estimated by extrapolating a horizontal line from this mark to the edge of the wetland.

NOTE: Avoid making visual estimates of area covered by seasonal ponding when standing at the wetland edge. These estimates are usually very inaccurate. A simple sketch, or a drawing of the boundary on an aerial photograph, is a much more accurate tool to use for estimating area.

D 2.0 Does the Depressional Wetland Have the Opportunity to Improve Water Quality?

Rationale for indicator: The opportunity for wetlands to improve water quality in a watershed is related to the amount of pollutants that come into the wetland. Qualitatively, the level of pollutants can be correlated with the level of disturbance, development, and intensity of agriculture in the landscape. For example, relatively undisturbed watersheds will carry much lower sediment and nutrient loads than those that have been impacted by development, agriculture, or logging practices (Hartmann et al. 1996, and Reinelt and Horner 1995). The opportunity that a wetland has to improve water quality is, therefore, linked to the amount of development, agriculture, or logging present in its immediate surroundings or in the up-gradient part of its contributing basin.

For the purpose of rating, it is assumed that a wetland has the opportunity to improve water quality if the amount of pollutants coming into the wetland as a result of human activities is higher than the pollutants (sediment and nutrients) that would be coming from natural causes. It is the removal of this excess pollution that is considered to be a valuable function for society.

Answer YES if there are pollutants caused by human activities in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland.

Users of the rating system must make a qualitative judgment on the opportunity of the depressional wetland to actually improve water quality by asking the question. Are there any sediments, nutrients, toxic chemicals, or other pollutants coming into the wetland from human activities that can reduce water quality waters downgradient from the wetland? Pollutants can come into a wetland both through groundwater and surface runoff.

A key to characterizing the opportunity for this group of functions is to consider the routing of runoff into and through a wetland. If adjacent areas lack evidence of surface runoff that enters the wetland, then few if any pollutants may be transferred to the wetland. Some systems of ditches that are found along the edges of wetlands route polluted runoff away from the wetland. If the wetland never floods then the pollutants have no chance to interact with the wetland. In these cases the wetland would not have the opportunity to improve water quality even though pollutants are introduced into the aquatic system in the vicinity of the wetland.

The question on the rating form lists several examples of conditions that result in pollutants reaching a wetland and therefore provide the opportunity for the wetland to improve water quality. You are asked to note which of the following conditions provide the sources of pollutants.

- Grazing in the wetland or within 150ft. The issue here is nutrients coming into the wetland from animal droppings, from domesticated animals. The wetland has the opportunity to improve water quality if you can see recent droppings from domesticated animals, and you judge that nutrients and bacteria from these can be washed into the wetland.
- Wetland intercepts groundwater within the Reclamation Area. Groundwater within the reclamation area is polluted with pesticides and high levels of nutrients

(Williamson et al. 1998).

- Untreated stormwater flows into the wetland. Stormwater is a source of sediment and toxic compounds.
- Tilled fields or orchards within 150 feet of wetland. Agriculture is a source of pesticides, nutrients, and sediments. The input of these pollutants to the wetland can be either by surface runoff or windblown dust.
- A stream or culvert brings water into wetland from developed areas, residential areas, farmed fields, roads, or areas that have been clear-cut within the last five years. Streams or culverts can bring in pollutants that are released outside the immediate area of the wetland. If you find a stream or culvert coming into the wetland, you will need to trace the course of the stream and determine if it passes through areas that can release pollutants.
- Land uses within 150 ft of the wetland that generate pollutants (residential areas having more than 1 house per acre, urban areas, commercial areas, and golf courses). These areas potential source of pollutants from lawn care, driveways, pets, and parking lots.

The rating form has space to note potential sources of pollutants coming into the wetland not mentioned above. If you observe or know of other sources, note this on the form.

Note: Depressional wetlands that have no outlet (closed depression) may still have the opportunity to remove nutrients because they are usually connected to the groundwater system. Some pollutants such as nitrates and ammonia can be carried into the groundwater from surface runoff. Closed depressions, therefore, may provide a significant function by removing nitrates before they can get into the groundwater.

Note: Highway infrastructure, both existing and proposed, include features that are designed to convey and treat water for water quality improvements and flow control. These features, including ditches, vegetated filter strips, stormwater ponds, infiltration basins, and other stormwater best management practices (BMPs), route water from and through a project area, and therefore must be understood to adequately make an "opportunity call" for wetlands located near the highway. If these systems are effective at blocking most nutrients and pollutants from getting into a wetland the wetland will **not** have the opportunity to perform these functions.

The data sheet gives the number of points a wetland should score for the indicators of potential. Add the scores for the indicators of potential and multiply by [1] or [2] depending on the "opportunity." The total score should be carried forward to page 1 of the rating form.

D 3.0 Does the Depressional Wetland Have the <u>Potential</u> to Reduce Flooding and Stream Erosion?

D 3.1 *Characteristics of surface water outflows from the wetland:*

Rationale for indicator: Depressional wetlands with no outflow are more likely to reduce flooding than those with outlets, and those with a constricted outlet will more likely reduce flooding than those with an unconstricted outlet (review in Adamus et al. 1991). In wetlands with no outflow all waters coming in are permanently stored and do no enter any streams or rivers. Constricted outlets will hold back flood waters and release them slowly. Furthermore, wetlands with seasonal outflows in eastern Washington are more likely to reduce flooding than those with permanent flows because these wetlands usually dry up between the times water flows out. This means that the water level will fall below the lip of the outlet and additional storage is created.

See the description for question D 1.1. This question is answered the same way as question D 1.1. The difference between D 1.1 and D 3.1, however, is in the scores assigned each type of outflow. Differences in scores are based on the difference in importance of the outflow characteristics to the "water quality" functions and the hydrologic functions.

D 3.2 *Depth of storage during wet periods:*

Rationale for indicator: The amount of water a wetland stores is an important indicator of how well it functions to reduce flooding and erosion. Retention time of flood waters is increased as the volume of storage is increased for any given inflow (Fennessey et al. 1994). It is too difficult to estimate the actual amount of water stored for a rapid tool such as the rating system, and we use an estimate of the maximum depth of storage as a surrogate. This is only an approximation because depressional wetlands may have slightly different shapes and therefore the volume of water they can store is not exactly correlated to the maximum depth of storage. The correlation, however, was judged to be close enough for the purposes of this rating system.

The depth of the water stored during can be estimated as the difference in elevation between the upper edge of seasonal ponding/inundation and the low point of the wetland as described below (see figure 18) .

For wetlands that have areas of permanent ponding, the lowest point is the surface of the permanent ponding (as measured at its lowest point, typically in late summer and fall). See Figure 19 for an example. You should estimate the height of seasonal ponding above that. For wetlands that have no areas of permanent ponding, locate the lowest point in the wetland and measure the depth of the ponding above that.

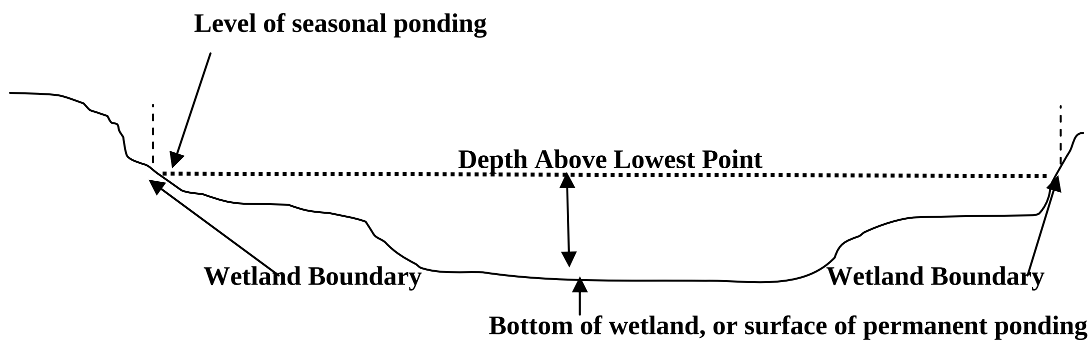


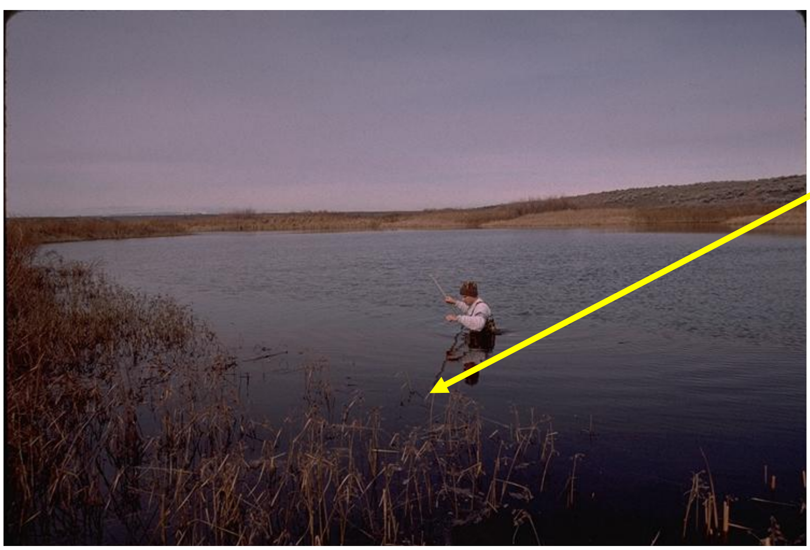
Figure 18 – Measuring maximum depth of seasonal ponding.

There are marks on the shore left behind by the “high water” during the seasonal maximum.

The difference in elevation between the mark on the shore and the level of the permanent ponding is the depth of seasonal storage.

Figure 19: A depressional wetland with permanent water present. This is the maximum extent of summer “drawdown” in the wetland. The difference between this level and the seasonal high water mark is more than three feet.

NOTE: During the winter and spring it may be difficult to identify the level to which the water drops during the summer. In general, the level will usually be at the edge of the area dominated by large, obligate, emergent plants such as *Scirpus acutus* or *Typha latifolia* (Figure 20). Use the lower edge of this vegetation as the “bottom” from which to estimate the depth of seasonal ponding. Estimate the difference in elevation between the bottom of the plants and any marks of ponding or inundation along the shore to estimate the depth of seasonal ponding.



Use the depth of water along the inward edge of emergent plants (bulrushes in this case) to estimate the depth of seasonal ponding. In this case the depth of water is about 3.5 ft at the edge of the vegetation.

Figure 20: A depressional wetland with water level close to its seasonal maximum. This is the same wetland as shown in Figure 19 but photographed in March rather than late September.

There are five thresholds used to score this characteristic: 3 ft. or more than of storage, 2 ft to <3 ft of storage, 1 ft to <2 ft, 6 inches to <1ft, and less than 6 in. Your measurements, therefore, do not need to be exact. These thresholds can usually be estimated without needing to use special equipment.

Headwater wetlands: This question also asks if the wetland being categorized is a "headwater" wetland. Depressional wetlands found in the headwaters of streams often do not store surface water to any great depth. They are however, important in reducing peak flows because they slow down and "desynchronize" the initial peak flows from a storm (Brassard et al. 2000). Their importance in hydrologic functions is often under-rated (statement of Michael L. Davis, Deputy Assistant of the Army, before the committee on Environment and Public Works, Subcommittee on Clean Air, Wetlands, Private Property and Nuclear Safety, United State Senate, June 26, 1997). The depth of seasonal storage in headwater wetlands was judged to be an inadequate representation of the importance of these wetlands in the hydrologic functions. For this reason, headwater wetlands are scored 6 points, out of 8 possible, regardless of the depth of seasonal storage.

To identify if the wetland being rated is a "headwater" wetland, use the information collected in question D 1.1. If the wetland has a permanent or seasonal outflow but NO inflow from a permanent or seasonal stream, it is probably a "headwater" wetland for the purposes of this categorization. NOTE: One exception to this criterion is wetlands whose water regime is dominated by groundwater coming from irrigation practices or from a hillside seep. Depressional wetlands at the base of dams or edge of irrigation canals or slope wetlands are not headwater wetlands, even if they have surface water flowing out of them.

D 4.0 Does the Depressional wetland Have the Opportunity to Reduce Flooding and Stream Erosion?

Rationale for the indicator: The opportunity for wetlands to reduce the impacts of flooding and erosion is based on the presence of human or natural resources that can be damaged by these processes. The indicator used characterizes whether the wetland's position in the landscape will protect downgradient resources from flooding. We ask if there are resources in the watershed that can be damaged by flooding and erosion. These resources include both human and natural ones.

Answer YES if the wetland is in a position in the watershed where the flood storage, or reduction in water velocity, it provides can reduce damage to downstream property and aquatic resources.

One way to consider this question is to ask yourself, where would the surface water coming into a wetland go if the wetland were filled? The surface water that would have been stored in the wetland during storms has to go somewhere. If the surface water runs off directly into a stream or river that has problems with flooding, then the storage provided by the wetland is important because it decreases the downstream flooding. In this case the wetland DOES have the opportunity. If, however, the water leaving the wetland is controlled in some way that prevents it from affecting flooding, the wetland does NOT have the opportunity. A USGS topographic map is a good tool to use to answer this question. The map will show buildings, bridges, or other structures in the floodplain of a river or stream. An aerial photograph can also be useful to identify resources that might be impacted by increases in surface flows.

The landscapes in eastern Washington are quite varied and it may be difficult to judge whether a wetland has the opportunity to perform hydrologic functions. The following points are provided as a guide to help you answer this question.

- Many depressional wetlands with no surface water outflow have the opportunity to perform the hydrologic functions because they are up-gradient of resources. They are actually performing the hydrologic functions at the highest levels possible. No surface water leaves the wetland to cause flooding or erosion. The water either infiltrates to groundwater or it evaporates. To answer the "opportunity" question for a wetland with no outflow, try to picture the wetland as "filled" with a parking lot. Where would the surface water it normally stores flow? If it would flow into a swale, channel, or stream, there is a possibility that the flow would increase flooding or erosion.
- When a wetland is situated upslope of a road where water movement through the road is limited by ineffective culverts, the roadway typically acts a levee, de-coupling upslope wetlands from the floodway. The road delays drainage from entering the floodway in a timeframe where it can contribute to peak flows. Also, the road prevents surface flows within the floodway from directly entering the wetland as they rise and prevent using the storage capacity of wetlands that are upslope of the road. Wetlands upslope of a road **do not have** opportunity to provide hydrologic functions if the road impounds surface water near the rated wetland during flood events and keeps it impounded for some time after the flood recedes. This indicates that the hydrologic connection between the floodway and the upslope area is impaired. If, however, the water impounded on the upslope side of the road recedes at the same rate as a flooding event, you can assume the connections through the road are not constrained. In this case the storage provided by the wetland on the upslope side is important, and the wetland **does have** the opportunity.
- Wetlands that are situated at the base of a hillside, typically receive significant water inputs from groundwater. The rating system includes guidance that states wetlands that receive 90% of their water from groundwater do not have the opportunity. Seep wetlands at the base of hills that are outside of the floodplain generally meet the intent of this criteria because of their landscape position. If the only hydrologic inputs that can be observed are from a spring/seep emerging from a hillslope, then the rated wetland likely does **not** have opportunity. If, however, there are indicators that the wetland receives surface runoff from further up the slope (e.g. small gullies, washes, etc.) as well as groundwater, then the wetland may have the opportunity if there are flooding problems further downstream.
- A depressional wetland that receives only return flow from irrigation also does **not** have the opportunity to perform the hydrologic functions. Since the inflow is controlled, there is little chance that the water coming into the wetland will cause downstream flooding or erosion.
- A depressional wetland behind a dike in a river mouth does **not** have the opportunity because there are few resources further downstream that can be

impacted by flooding, and the wetland is often disconnected from the floodplain.

- A wetland has to receive surface water (either storm or snowmelt) in order for it to reduce flooding. If the source of water to a wetland is groundwater only, then it does **not** have the opportunity to perform the function because it receives no surface water that might cause flooding or erosion further downgradient. For example, alkali wetlands are so dominated by groundwater that they are judged not to have the opportunity to perform the hydrologic functions defined in this rating system.
- A wetland that receives only return flow from irrigation also does **not** have the opportunity to perform the hydrologic functions. Since the inflow is controlled there is little chance that there will be “uncontrolled” water coming into the wetland than can cause downstream flooding or erosion.